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RECOMMENDED GUIDELINES FOR SMALL GROUNDWATER SUPPLY SYSTEMS FOR RESIDENTIAL DEVELOPMENTS

JULY 1977

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Recommended guidelines for
small ground water supply
systems for residential
development.

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MINISTRY OF THE ENVIRONMENT -

MUNICIPAL ENGINEERS ASSOCIATION

LIAISON COMMITTEE

RECOMMENDED GUIDELINES

FOR

SMALL GROUNDWATER SUPPLY SYSTEMS

FOR RESIDENTIAL DEVELOPMENTS

JULY 1977

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FORWARD

These guidelines have been prepared by a small committee of Provincial and Municipal Engineers who are familiar with the current practice within the Province of Ontario with respect to small residential groundwater supply systems. While it has been the purpose of past guidelines to outline minimum acceptable standards for servicing, it is the intention of this guideline to describe desirable standards of servicing for small groundwater systems.

It is recognized that conditions from municipality to municipality differ significantly and that strict adherence to these guidelines will not always be possible. It is hoped, however, that these guidelines will assist municipalities in their development of design standards that will be applicable to their own particular conditions and type of development.

Adherence of designs to these guidelines will not be a requirement for approval by the Ministry of the Environment under Section 41 of The Ontario Water Resources Act. Instead, the Ministry of the Environment will continue to issue approvals for systems based on their satisfaction of minimum acceptable standards applied on a province-wide basis.

Units of measurement have been expressed in SI units wherever possible. In general, the metric dimensions represent a "soft conversion" and minimum sizes may have to change when manufacturers begin construction of equipment, etc., in the "hard" metric sizes.

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MINISTRY OF THE ENVIRONMENT - MUNICIPAL ENGINEERS ASSOCIATION

RECOMMENDED GUIDELINES FOR SMALL GROUNDWATER SUPPLY SYSTEMS FOR RESIDENTIAL DEVELOPMENTS

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RECOMMENDED GUIDELINES FOR SMALL GROUNDWATER SUPPLY SYSTEMS FOR RESIDENTIAL DEVELOPMENTS

CHAPTER 1

General

REASONS FOR COMMUNAL SUPPLIES

1.1 In the interests of consumer protection and water supply security, the construction of communal water supply systems for clustered developments is recommended. These developments, usually in rural areas, have formerly been constructed utilizing individual domestic water wells in association with septic tank and tile field disposal methods for sanitary wastes. Public health studies have shown that over the years undesirable chemical and bacteriological changes can occur in the groundwater due to the flow of sewage effluent from the septic tank and tile bed systems. Such problems can be minimized through the use of communal well systems due to the fact that such wells can be located remote from septic tank locations and can generally be constructed to higher standards than individual household wells. In areas where the raw water quality requires treatment, the use of communal wells will allow for the installation and proper operation of whatever treatment systems are necessary, whereas with individual household well supplies treatment may be impractical from both the economic and operational standpoints.

UNSUITABLE HYDROGEOLOGIC CONDITIONS

1.2 It is realized that in many areas within the Province of Ontario a communal water supply system of sufficient yield to serve the resident population simply cannot be developed because of unsuitable hydrogeologic conditions whereas basic household water requirements can be supplied from individual wells.

COMMITTEE

1.3 The committee responsible for the development of these guidelines consisted of the following persons:

- J. D. Pawley, P. Eng., Region of Waterloo
- R. D. Funnel, P. Eng., City of Guelph
- G. A. Missingham,P.Eng., Min. of Environment
- D. D. B. Cane, P.Eng., Min. of Environment

1.4 In defining the small water supply system, the committee felt that these guidelines should be applied to those residential developments where the ultimate population is not to exceed 500 persons. Although the guidelines are intended primarily for permanent residential developments they should also be followed for seasonal occupancy developments. Such developments tend to eventually evolve toward extended or full-term occupancy and the water supply system should be designed with this possible change in mind.

POPULATION

1.5 The decision as to when the communal water supply system guidelines should be applied, should be decided by the municipality or regulatory agency, however, the following recommendations are provided for guidance.

APPLICATION OF GUIDELINES

1. Where an excess of ten residential lots or dwelling units are to be developed and the average lot size is less than 0.8 hectares, a communal water supply system shall be provided, if hydrogeological conditions are favourable for development of suitable wells.

2. Where the lot size is to be 0.8 hectares or greater, individual wells will be allowed, unless the subdivision is located within or adjacent to a hamlet or settlement which may be provided with a municipal water supply system in the future. In this case, as a minimum, watermains complete with house connections shall be provided at the time of installation of other services. It shall be the decision of the municipality as to whether a communal water supply system shall be provided in the interim, or whether private wells will be allowed.

1.6 The decision on whether fire protection capabilities must be provided by the water supply system is a municipal responsibility. In deciding upon the need for such protection the municipality should consider such factors as availability of an adequate supply of water. Guidelines on fire protection requirements can be obtained from the Insurers Advisory Organization, 36 Toronto Street, Toronto, Ontario (416-363-9361).

FIRE PROTECTION

1.7	All plans and specifications must be prepared by a qualified Professional Engineer.	PROFESSIONAL ENGINEER
1.8	Approval of all water supply and distribution system plans and specifications must be obtained from the Ministry of the Environment prior to construction.	M.O.E. APPROVAL
1.9	Pump and well houses must be constructed in accordance with Ministry of Labour regulations.	MINISTRY OF LABOUR

CHAPTER 2

Water Production

WATER USE

2.1 Water use in small subdivisions can be divided into the following sectors:

1. Household use, i.e. bathing, cooking, laundering, disposal of sanitary wastes.

2. Outdoor use, i.e. garden and lawn irrigation, car washing, ornamental fountains, etc.

3. Fire protection.

2.1.2 Experience has shown that while 0.04 to 0.075 litres per second per lot continuous water production will satisfy indoor requirements, the impact of summer lawn watering and garden irrigation causes peak demands of 0.45 litres per second per lot or more. This trend is accentuated where lots are oversized to accommodate the disposal of sanitary wastes in septic tank and tile field systems.

2.1.3 For general guidance, it is recommended that 0.075 litres per second continuous production be provided per lot where unrestricted outdoor watering will be permitted. Peak demands will be provided from storage and high lift pumping equipment should be sized to satisfy these peak demands.

FIRE PROTECTION

2.2 Where fire protection is to be provided, the Insurers Advisory Organization (IAO) suggest that as a minimum, a fire flow of 30 litres per second be provided for a two hour period. Where the production wells cannot provide this demand, it must be supplied from storage, however, adequate production must be available to refill the storage reservoir over an eight hour period. It is suggested that a well production capacity of at least 7.5 litres per second be provided for this purpose over and above domestic demands.

HYDRO-GEOLOGY REPORT

2.3 Prior to draft approval of the subdivision plan, a quantitative and qualitative evaluation of the groundwater resources at the site and degree of treatment required must be made by a Consulting Hydrogeologist. The hydrogeologist's report should be forwarded to the municipality and the consulting engineer acting on behalf of the municipality or the developer for approval. Extra copies of this hydrogeologist's report should be prepared for subsequent submission to the M.O.E. regional office and the M.O.E. Approvals Branch.

2.4 The developer shall be responsible for the application to the Ministry of the Environment for a permit to take water where the daily withdrawal will exceed 45.5 cubic metres. The developer shall be responsible for all conditions imposed by this Ministry in the permit including compensation to private well owners when well interference has been caused by water withdrawals from the wells described in the permit. RESPONSIBILITIES OF DEVELOPER

2.5.1 At least two operating wells must be constructed in order to provide the required water supply capacity. The wells should be fully developed at the time of construction according to standard well development techniques. The capacity of the alternate or standby well should be at least 25 per cent of the total production requirement. NUMBER OF WELLS

2.5.2 Where two subdivisions containing communal systems abut, interconnection of the distribution systems with a suitable operating agreement between developers may be allowed as an alternative to the second well.

2.5.3 Water supply for the complete developable area should be provided on initial well construction.

2.6 Well design and construction shall be consistent with the American Water Works Association "Standards for Deep Wells" report A100-66, as well as the Ministry of the Environment's Regulation 648/70, "Water Wells", written under The Ontario Water Resources Act. For further details on well construction standards reference should be made to the Manual of Water Well Construction Practices, EPA Report 570/9-75-001. WELL CONSTRUCTION STANDARDS

2.7 The minimum casing diameter of the largest production well shall be not less than 200 mm I.D. Smaller diameter casings, but not less than 150 mm I.D. may be allowed for standby wells or wells located in areas where the maximum developable capacity is limited. Casings should extend a minimun of 150 mm above the floor or where outside the pumphouse, above ground level. WELL CASING

2.8 Each well in the overburden shall be equipped with a stainless steel well screen with slot openings designed for the aquifer material or gravel pack in which the screen is placed. WELL SCREEN

2.9 An approved tamper-proof well seal shall be provided to prevent contamination. Each well shall be equipped with a 25 mm minimum diameter WELL SEAL

threaded and plugged access hole for introduction of a measuring tape or electric depth gauge. WELL SEAL (CONTINUED)

2.10 Each well shall be equipped with an air line and suitably graduated altitude gauge for monitoring the depth to the water level. When wells are located outside the confines of the pumphouse, the air line and gauges shall be terminated within the pumphouse. AIR LINE

2.11 A low level cutoff shall be installed in each well to prevent the operation of the well pump when the water level in the well approaches a critically low level. LOW LEVEL CUTOFF

2.12 Rate of flow controllers should be provided on the well discharge lines upstream of the waste discharge pipe to ensure that the maximum production capacity of the well is not exceeded. FLOW CONTROL

2.13 Where a well is constructed outside the confines of the pumping station an approved sanitary seal shall be provided over the exposed well casing and a pitless adaptor shall be installed so that the well discharge can be routed to the pumphouse at a depth of at least 1.5 metres. A pitless adaptor should not be installed when the static level is above the proposed adaptor location. PITLESS ADAPTOR

2.14 Each well shall be equipped with a suitable vent terminating sufficiently high to be above any possible flood level. WELL VENT

CHAPTER 3

Storage Requirements

STORAGE VOLUME

3.1 Minimum effective storage shall be based on the total of average day domestic demand plus fire reserves. Average day can be calculated on the following basis:

> No. of dwelling units x No. occupants x 360 litres per capita per day + any industrial, commercial or institutional uses.

PERSONS PER UNIT

3.2 The number of persons occupying a particular type of housing unit will vary from municipality to municipality. The following table, however, is provided for guidance:

Table of Unit	No. of Occupants
Single Family	3.6
Semi-Detached	3.8
Duplex	3.8
Triplex	3.8
Townhouse	3.8
Apartment	2.8

FIRE RESERVES

3.3 Fire reserves in storage for residential demands shall be based on the provision of at least 30 litres per second for two hours less the water production capability of the production wells which is allocated to fire protection. For example, 216 cubic metres of water would be required to fight the hypothetical two hour fire at 30 litres per second, however, if the production capability of the wells exceeds the normal domestic requirement by 7.5 litres per second, the effective storage required can be reduced to 162 cubic metres. Fire demands for industrial, commercial or institutional buildings should be calculated separately.

TWO CELLS

3.4 Where underground storage reservoirs are to be constructed, the structure must consist of at least two interconnected cells with each cell vented to atmosphere and containing access hatches in the roof. Vent openings must be protected from vandalism and constructed in such a way as to exclude dust and dirt.

OVERFLOW

3.5 Overflow drains should be provided with adequate protection to eliminate the possibility of the flow of contaminated surface water to the reservoir.

3.6 Low-lift discharge and high-lift suction piping shall be arranged so that each cell can be operated singly or in parallel. SINGLE OR PARALLEL OPERATION

3.7 A float gauge or other simple indicating device shall be provided in the pumphouse to indicate reservoir level. FLOAT GAUGE

CHAPTER 4

Low Lift Pumping Equipment

WELL PUMPS

4.1 Pumping from the water production wells to the storage reservoir shall be accomplished with approved submersible or vertical turbine pumps. Operation of these pumps shall be regulated by the utilization of high and low-level sensing probes in the storage reservoir. The weight of the pump shall not be borne on the casing and the casing shall have a spacer between it and the pumphouse floor.

CONTROLS

4.2 Suitable controls shall be provided to operate each well singly or together on automatic or manual modes.

FOOT AND CHECK VALVES

4.3 While not an absolute requirement, consideration should be given to the provision of foot valves on well pumps. Flow regulating valves on the pump discharge lines should be provided with a check feature.

BYPASS ARRANGEMENT

4.4 A connection shall be made from the low lift discharge to the distribution system so that the high lift pumps may be bypassed and water provided to the distribution system upon failure of the high lift pumping equipment or storage reservoir.

PUMP TO WASTE

4.5 A conduit from the low lift discharge to the exterior of the pumphouse shall be provided for pumping to waste and for testing of the well or wells. The waste discharge should be at least 300 mm above ground level and adequate drainage away from the site will be required. Isolating valves shall be placed on the low lift discharge in order that this function can be accomplished.

The waste discharge line shall be equipped with an attachment for a manometer tube inside the pumphouse and provision for the installation of a standard circular orifice plate at the end of the discharge to waste line. The manometer fitting shall be located 600 mm from the end of the discharge to waste line. The discharge piping shall be precisely horizontal and shall have no obstructions or bends for at least 1.2 metres upstream of the manometer fitting. If possible, the waste discharge shall be located downstream from the meter (in a non-reservoir system) so as to permit testing of the meter.

4.6 Air release valves should be provided at all high points in the piping system where air accumulations are likely to occur.

AIR RELEASE VALVES

CHAPTER 5

High Lift Pumping Equipment

TWO HIGH LIFT PUMPS

5.1 At least two high lift pumps must be installed to provide a 0.45 litres per second per dwelling unit domestic demand.

FIRE PUMP

5.2 Where fire protection is to be provided, a high lift pump of at least 30 litres per second capacity must be installed.

DOMESTIC PUMPS

5.3 It is suggested that the lead high lift pump be sized at 0.15 litres per second per lot with the standby pump being sized at 0.3 litres per second per lot. During normal periods of domestic demand, the smaller pump will provide an adequate supply of water, while the larger pump will only be brought on to accommodate irrigation demands or when the lead pump is out of order.

PRESSURE REGULATION

5.4 The domestic pump operation shall be controlled by pressure switches. Pressure regulation in the distribution system shall be accomplished by pressure regulating valves with pressure relief to the storage reservoir under low demand conditions. In very small systems, cushion tanks may be used to control the operation of the domestic pumps.

MINIMUM PRESSURE

5.5 Minimum system pressure at the highest point in the distribution system shall be 275 kPa (kilopascals) under normal conditions. During periods of fire demand, the pressure in the distribution system should not fall below 140 kPa.

CHAPTER 6

Electrical Equipment

6.1	Preferred power supplies shall be from a bank of three single phase distribution transformers with secondaries delta connected and ungrounded. Two transformers connected open delta will be unacceptable.	TRANSFORMERS
6.2	All electric motors over 0.37 kw shall be 575 volts, 3 phase, 60 hz. Motors shall be provided with drip-proof totally enclosed or submersible enclosures and the motors should be to C.E.M.A. standard MG-1 and be C.S.A. approved.	ELECTRIC MOTORS
6.3	Overload protection shall be provided on each phase. All motor starters are to be combination type moulded case breaker. Breakers shall be equipped with adjustable magnitude trip only, i.e. M.C.P. type. Reduced voltage starters shall be provided on all motors over 15 kw. Where 120 volt control is required with 575 volt starter, each starter shall include an integral control transformer with a fused secondary.	MOTOR STARTERS
6.4	All electrical apparatus shall be located in an accessible location with a clear access of approximately 0.75 metres around all pumps and motors. This equipment shall be mounted on a concrete base at least 150 mm above floor level. Electrical conduit to the specifications of the electrical inspector must be used throughout the pumphouse as well as for the lines to the wells. All panels and controls shall be moisture resistant.	ELECTRICAL APPARATUS
6.5	Pumphouse heating shall be by electrical unit heaters with individual built-in thermostats. Fluorescent lighting is to be provided in all structures requiring day-to-day access. A weather-proof switch and electrical outlet shall be placed inside the pumphouse immediately adjacent to the access door.	HEATING
6.6	A single outside light shall be provided over or adjacent to the access door and its operation shall be regulated with a timer. This light should be adequately protected against vandalism.	OUTSIDE LIGHTING
6.7	Lightening arresters shall be provided at the 600 volt terminals at the hydro terminal pole.	LIGHTENING ARRESTERS

6.8 If one or more production wells are located external to the pumphouse, lockout disconnect switches must be provided for each submersible pump and these switches shall be located in the pumphouse. WELL PUMP DISCONNECTS

6.9 Consideration may be given to the installation of a standby diesel generating unit to provide for full operation of the production well and high lift pumping equipment upon power failure. STANDBY POWER

6.10 A final inspection certificate from the Ontario Hydro Inspection Branch on all building and equipment wiring is required prior to the commencement of system operations. INSPECTION CERTIFICATE

CHAPTER 7

Controls, Instrumentation and Metering

CONTROLS

7.1 The following controls shall be provided between the storage reservoir and the high and low lift pumping equipment:

1. A low level cutout to shut off high lift and fire pumping equipment when the reservoir level drops to a critical level.

2. A high level cutout for well pumps at the maximum top water level in the reservoir.

3. Level sensors to operate the production wells sequentially.

PRESSURE SWITCHES

7.2 Pressure switches shall be mounted on the discharge line from the pumphouse to operate the high lift pumping equipment sequentially. It is suggested that system pressure be maintained at 400-450 kPa utilizing the smaller of the two domestic high lift pumps with the larger pump being placed in operation on a pressure drop to 340 kPa and the fire pump to operate upon a further pressure drop to 240 kPa. Maximum system pressures should not exceed 690 kPa.

PRESSURE GAUGE

7.3 A pressure gauge shall be installed on the discharge of the high lift pumps.

HOUR METERS

7.4 Hour meters shall be provided on all electrical motors.

FLOW METER

7.5 Flow to the distribution system shall be monitored with a recording flow meter calibrated in cubic meters. The recording device shall be electrically-driven with seven-day circular charts. In the case of small systems where it is not anticipated that extensions to the distribution system will be added the recording device may not be required.

FIRE PUMP CONTROL

7.6 The start-stop operation of the fire pump should be arranged between the municipality and the local fire officials. Indication of the operating status of the pump should be relayed to an answering service or central operating point where 24 hour surveillance is provided.

CHAPTER 8

Pumphouse and Well Head Requirements

PUMPHOUSE

8.1 For each water supply installation, a suitable pumphouse of concrete block, prepainted steel or other suitable material shall be constructed. In all cases the pumphouse shall conform to local building and zoning bylaws as well as Ministry of Labour regulations. The building shall be completely insulated and sized so that all equipment is accessible for maintenance. At least 5 sq.metres must be provided for the storage of chemicals.

STEEL BUILDING

8.2 If a frameless steel building is to be constructed, provision must be made to support wall-mounted equipment. This can be accomplished by providing a sub-frame suitably anchored to the concrete floor during initial construction.

8.2.2 Exterior prepainted steel panels shall be spray painted and baked prior to delivery.

ACCESS HATCH AND DOORS

8.3 A hatch of minimum 900 mm by 900 mm size shall be provided in the roof of the well house directly over each well situated therein. The hatch may, if desired, be a removable skylight. To allow for pump removal, the well must be positioned from 600 to 1,200 mm from the outside of the wall, end on the side of the building where there is heavy vehicle access to permit the use of a crane. The entrance doors should open outwards and should be sized so as to be wider than the largest piece of equipment in the pumphouse. Double doors should be considered when the pumphouse contains a diesel generator system.

VENTILATION

8.4 To discourage vandalism, windows should be omitted in pumping stations and well houses. Ventilation shall be accomplished by an exhaust fan operated by a thermostat. The exhaust outlet shall be located on a wall near the ceiling with inlet louvres located near the pumphouse floor on the opposite side of the building. The inlet louvres shall be controlled to open when the exhaust fan is operating and to close when the exhaust fan is off. Heavy type steel intake and exhaust louvres should be specified to minimize damage by vandals.

8.5 Exhaust fan capacity shall be sufficient to provide five to six air changes per hour. FAN CAPACITY

8.6 All building locks shall be flush mounted, dead bolt and jimmy proof. Keying arrangements shall be specified by the municipality. LOCKS

8.7 Raw and treated water sampling taps shall be provided on the discharge lines of the low lift and high lift pumps. Treated water taps should be located at a sufficient downstream distance from chemical application points to ensure that complete mixing has taken place prior to withdrawal of samples. SAMPLING TAPS

8.8 All high lift pumps, motors and cushion tanks must be placed on concrete bases at least 125 to 150 mm above floor level. PUMP AND MOTOR BASES

8.9 The building floor shall be a minimum of 300 mm above the external ground surface and/or any potential flood level. Pumphouse floors must be of poured reinforced concrete and shall slope towards the access door. Concrete floor slabs and pump bases should be sleeved from the well casing. FLOORS

8.10 A fire extinguisher, type ABC, shall be provided in each building. FIRE EXTINGUISHER

8.11 All interior and exterior wall surfaces, doors and trim shall be painted to a colour scheme as approved by the municipality. PAINTING

CHAPTER 9

Water Supply Property and Access Requirements

9.1 All property, structures, distributing mains and appurtenances associated with the water supply, storage and distribution works are to be deeded to the municipality. — PROPERTY DEEDED TO MUNICIPALITY

9.2 Actual property requirements shall be negotiated prior to approval of the water supply system by the municipality. Property requirements will vary, but as a minimum, access for large service vehicles should be provided and space for temporary holding lagoons which will be required for acid wastewaters during well maintenance. — PROPERTY REQUIREMENTS

9.3 All property associated with above-surface plant shall be fenced with a chain link security fence at least 1.8 metres high. The fencing material shall be No. 9 gauge, 2 x 2, steel chain link wire fencing, galvanzied following fabrication. A 3.6 metre gate shall be provided for vehicular access. — FENCING

9.4 Access roads shall be provided to each pumphouse, well head and reservoir. These roads shall be designed and constructed for year-round use. — ACCESS ROADS

9.5 Overhead electrical wires and the location of transformers must be situated in such a way as not to interfere with the operation of crane equipment over the well house or well heads. — OVERHEAD WIRES

CHAPTER 10

Water Quality

10.1 Where the quality of the raw water does not meet the following objectives, the municipality in conjunction with the Ministry of the Environment shall decide as to treatment required. In cases where the water quality is extremely poor, a recommendation may be made for the rejection of the source.

WHERE TREATMENT REQUIRED

Table A

PARAMETER	DESIRABLE CRITERIA
Colour	5 Units
Turbidity	1 Formazin Unit
Taste and Odour	Inoffensive
Ammonia as NH_4	0.5 mg/l
Chloride as CL	250 mg/l
Copper as Cu	1.0 mg/l
Fluoride as F	1.5 mg/l
Iron as Fe	0.3 mg/l
Manganese as Mn	0.05 mg/l
Nitrate as NO_3	45 mg/l
Total Dissolved Solids	500 mg/l
Sulphate as SO_4	250 mg/l
Sulphide as H_2S	Not Detectable
Zinc and Zn	5.0 mg/l
Total Organic Carbon	5.0 mg/l
Organic Nitrogen (N) Total Kjeldahl Minus Free Ammonia	0.15 mg/l
Methane	Less than 3 litres/ cubic metre of water

To evaluate the basic chemical quality of the groundwater, the following should be included:

Alkalinity
Hardness
pH
Silica

10.2 In addition, the presence of substances in excess of the concentrations listed in the following table shall constitute grounds for rejection of supply:

REJECTION OF SUPPLY

Table B

SUBSTANCE	CONCENTRATION MG/L
Arsenic (As)	0.05
Barium (Ba)	1.00
Cadmium (Cd)	0.01
Chromium (Cr^{6})	0.05
Cyanide (Cn)	0.20
Fluoride (F)	2.40
Lead (Pb)	0.05
Selenium (Se)	0.01
Silver (Ag)	0.05

10.3 A report indicating the physical, chemical and bacteriological quality of all proposed wells shall be submitted to the municipality along with plans and specifications of the proposed water supply system for approval. The raw water in each well shall be examined with respect to all of the above physical and chemical parameters and any other parameters that may be deemed necessary by the appropriate regulatory agency (i.e. radioactive nuclides, heavy metals, exotics, pesticides, etc.).

PHYSICAL, CHEMICAL AND BACTERIOLOGICAL QUALITY

CHAPTER 11

Water Treatment Equipment

11.1 The degree of water treatment required will depend on the chemical and bacteriological quality of the raw water. Water treatment requirements will be specified by the municipality in conjunction with the Ministry of the Environment upon examination of chemical and bacteriological information obtained at the time of pump testing. Chlorination facilities will be required at all systems, however, they may not necessarily need to be operated if good background water quality is evident. — DEGREE OF TREATMENT

11.2.1 As a minimum, one positive displacement chemical feed pump shall be installed and connected with plastic tubing to well discharge line. An alternate connection shall be provided on the discharge line of the high lift pumps to the distribution system. — CHEMICAL PUMP

11.2.2 Chemical feed pumps shall be hydraulically actuated diaphragm type with adjustable stroke length equipped with pressure relief valve (acting on the hydraulic fluid) and anti-syphon/back pressure valve on the pump discharge.

11.3 A chemical storage tank of at least 90 litres capacity shall be provided with the chemical feed pump. — CHEMICAL STORAGE

11.4 Chemical feed pumps shall be wired through the circuits of the production wells and/or high lift pumps so that the chemical is only added when the pumps are operating and dosage is proportional to pumpage rates. — CHEMICAL FEED PUMP CONTROL

11.5 An approved chlorine test kit shall be provided at each installation. — CHLORINE TEST KIT

CHAPTER 12

Water System Operation

12.1 While recognizing that operation of communal water supply and treatment systems should be performed by municipal personnel, it is realized that in the interests of economy and security, operation of remote systems can be accomplished with on-site personnel retained on a contractual basis. It should be clearly outlined in the subdivider's agreement as to which method of operation is to be undertaken with appropriate clauses outlining safe harmless agreements, insurance coverages, levying of water rates, and the possible takeover of operations by municipal personnel upon default.

OPERATING AGREEMENT

12.2 If the new water supply system is to be contractually operated, the municipality should levy on the developer a yearly inspection fee to defray the cost of routine system inspections by municipal personnel.

INSPECTION FEE

12.3 It should be understood that all capital costs of system construction should be recovered through the sale of lots and revenues obtained from the sale of water should only cover operating, maintenance and collection costs.

OPERATING AND MAINTENANCE COSTS

12.4 An operating manual must be prepared and turned over to the municipality. The manual must contain the following:

OPERATING MANUAL

1. As constructed mechanical and electrical drawings.
2. As constructed building and laboratory details.
3. As constructed distribution system.
4. Pump literature, curves and operating instructions.
5. Operating and maintenance instructions for standby equipment.
6. Names, addresses and telephone numbers of all equipment suppliers and installers.
7. Information on guarantees for all equipment.

CHAPTE 13

Domestic Metering and Water Services

13.1 It is well known that the use of domestic water meters is an effective control of wasteful water use. The municipality therefore should strongly consider the installation of water meters in all new homes being served with a communal water supply. To reduce costs of meter reading, remote read-out devices should be placed near the hydro and/or gas meter at the time of water meter installation. WATER METERS

13.2 A metered water rate with appropriate service charges, if required, should be established to provide revenue for the costs associated with operation, maintenance and collection based on anticipated consumption patterns. If this system is to be developer operated, a small profit on the operation should be allowed. WATER RATE

13.3 The minimum water service size shall be 19 mm diameter. The area municipality, however, may direct the developer to install 25 mm diameter services under the following conditions: SERVICE SIZE

1. Larger homes where larger instantaneous water demands can be expected.
2. The length of service lateral is in excess of 30 metres.
3. The pressure in the distribution system is low.

13.4 The area municipality shall designate the materials to be used in the installation of water connections. SERVICE MATERIALS

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Recommended guidelines for small ground water supply systems for residential developments.

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